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ORIGINAL RESEARCH

Monitoring of polycyclic aromatic hydrocarbons and probabilistic health risk assessment in yogurt and butter in Iran

Amin Kiani[1] | Mahsa Ahmadloo[2] | Mojtaba Moazzen[3] | Nabi Shariatifar[3] | Saeed Shahsavari[4] | Majid Arabameri[5] | Mohammad Mahdi Hasani[6] | Ali Azari[7] | Mosaad A. Abdel-Wahhab[8]

[1]Department of Public Health, School of Public Health, Fasa University of Medical Sciences, Fasa, Iran

[2]Department of Food Safety and Hygiene, School of Public Health, Qazvin University of Medical Sciences, Qazvin, Iran

[3]Department of Environmental Health Engineering, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran

[4]Health Products Safety Research Center, Qazvin University of Medical Sciences, Qazvin, Iran

[5]Food Safety Research Center (salt), Semnan University of Medical Sciences, Semnan, Iran

[6]Department of Environmental Health Engineering, Faculty of Health, Tehran Medical Sciences, Islamic Azad University, Tehran, Iran

[7]Department of Environmental Health Engineering, Faculty of Health, Kashan University of Medical Sciences, Kashan, Iran

[8]Food Toxicology & Contaminants Department, National Research Center, Dokki, Egypt

Correspondence
Nabi Shariatifar, Department of Environmental Health Engineering, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran.
Email: nshariati@tums.ac.ir

Mosaad A. Abdel-Wahhab, Food Toxicology & Contaminants Dept., National Research Center, Dokki, Cairo, Egypt.
Email: mosaad_abdelwahhab@yahoo.com

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Abstract

This study was conducted to determine the polycyclic aromatic hydrocarbons (PAHs) levels and health risk of yogurt and butter samples collected from Tehran using MSPE/GC-MS (magnetic solid-phase extraction/gas chromatography-mass spectrometry). The results revealed that the limit of detection (LOD) and limit of quantification (LOQ) were ranged from 0.040 to 0.060 and 0.121 to 0.181 μg/kg, respectively; with recoveries ranged from 86.1% to 100.3%. The highest mean of total PAHs was higher in butter (6.87 ± 1.21 μg/kg) than in yogurt (3.82 ± 0.54 μg/kg). The level of benzo (a)pyrene in all samples was lower than of standard levels of the European Union (EU). The highest value of all PAHs in samples was recorded in the winter season and also in the expiration date. The percentile 95% of the total hazard quotient (THQ) due to the consumption of yogurt and butter recorded 1.33E-02 and 3.69E-04 in adults and 6.12E-02 and 1.75E-03 in children, respectively. The percentile of 95% incremental lifetime of cancer risk (ILCR) due to the ingestion of yogurt and butter recorded 1.17E-06 and 2.02E-08 for adults and 5.51E-06 and 9.46E-08 for children, respectively. The rank order of 7 PAHs in adult and children based on P95% Hazard Quotient (HQ) in all samples was benzo(a)anthracene (BaA) > pyrene (P) > fluorene (F) > fluoranthene (Fl) > acenaphthylene (Ace) > anthracene (A) > naphthalene (NA). According to the Monte Carlo Simulation (MCS) method, health-risk assessment showed that children and adults are not at significant health risk.

KEYWORDS

butter, gas chromatography-mass spectrometry (GC/MS), health risk assessment, occurrence, polycyclic aromatic hydrocarbons, yogurt